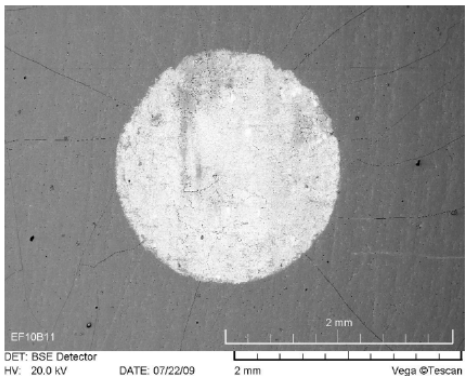

Fig. 9 MEB Observation of the scar under 150 N load

4. Conclusion

An experimental study was developed to analyze wear by fretting and predict life duration (lifetime duration) of the interface for a sphere/plane contact configuration for very thick layers. The fretting wear depends on the heterogeneous proprieties of coating and the wear rate remains closely related to the hardness and detachment of debris.

1. For low cycle number (low test duration up to 20000 cycles) the wear kinetics evolution induced by fretting is linear with an important removal of the upper layers that is related to the accommodation phenomenon of the displacement at the interface. The wear mechanism by adhesion is well-established.

3. For high cycle number (long test duration, 50000 cycles) a smooth increase is observed with the displacement amplitude and the kinetics evolution is parabolic.

4. The metal removal is an adhesive metal transfer mechanism and the metallic debris generated between fretted surfaces with flake-like morphology acts as a third body (powder) to soften wear like lubricant. However the hard and fragile thick layers present heterogeneity in mechanical proprieties with a high stress concentration that generate cracks during fretting loading at the contact.

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ANODINIMU APDOROTŲ STORŲ ALIUMINIO SLUOKSNIŲ FRETINGINIO DILIMO POBŪDIS

R e z i u m ė

Korpusinių detalių padengimas arba paviršiaus apdorojimas inžinerinėmis medžiagomis pagerina mechanines savybes ir atsparumą korozijai, tačiau nepagerina tribologinių savybių, pavyzdžiui, padengiant aliuminio lydiniais. Elementaria paviršiaus kontrole nustatomi paprasti parametrai, pavyzdžiui, šiurkštumas R_a. Šiame darbe trinties dilimo pobūdžiai nustatyti plokščiojo-sferinio kontakto (Al-Al_2O_3/plienas) metodu, naudojant stiprų anodinimą, buvo sudarytas labai storas aliuminio sluoksnis. Vertikalūs kietumo matavimai parodė sluoksnio storio nevienalytiškumą. Visi fretinginio dilimo bandymai buvo atlikti kambario temperatūroje didelio slydimo (Gros slip) režimu. Vidutinė trinties koeficiento vertė svyravo apie 1.1, ir

skersmens kitimas nuo sukauptos energijos rodė bendrą didėjimą. Fretingo stebėjimai optiniu mikroskopu ir SEM parodė, kad dilimas kontakte yra aghezinis. Be to, nustatyta, kad dėl kietumo nevienalytiškumo susidaro dideli įtempiai storame sluoksnyje ir tai yra svarbiausia paviršiaus plastinės deformacijos su paviršiaus plyšių formavimosi priežastis.

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WEAR FRETTING BEHAVIOR OF THICK HA ANODIZING ALUMINA LAYER

S u m m a r y

It is common to coat a substrate, or provide surface treatment to engineering materials with good mechanical proprieties and resistance against corrosion but poor tribological proprieties as aluminium alloys. The surface control at a rudimentary level is reached through a simple parameter such as the roughness Ra. In the present paper, very thick alumina layers were carried out by hard anodisation (HA) in order to determine the wear friction behavior with a plan-sphere contact (Al-Al_20_3/steel) configuration. Profile hardness shows heterogeneous proprieties through layer thickness. All wear fretting tests were carried out at room temperature under Gross slip régime. The mean friction coefficient varies around the value 1.1 and the evolution of the diameter against cumulated energy shown a net increase. The observations by optical microscopy and SEM of the fretting scars at the contact indicate an adhesion wear phenomena. In addition the heterogeneity in hardness creates a high stress in the thick layer and represents the principal cause of the superficial plastic deformation and formation of surface cracks.

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